FOR HEAVEN'S SAKE

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Despite his unconventional views, he's a pillar of India's scientific establishment

By Ashok Mahadevan

More than 40 years ago, when he was young, up-and-coming astrophysicist, Jayant Vishnu Narlikar gave a talk at my school. I was in class eleven and although pretty much everything he said went far over my head, I was puzzled by his claim that the universe was expanding. At question-time, I asked him how – if the universe was by definition everything that there is – it could expand. Wasn't the universe only expanding on itself?

He tried to explain, but I only grew more confused. Finally, he told me, "When you grow up, you'll understand."

Alas, I still don't. But soon after his talk at our school, Narlikar got a Padma Bhushan. Only 26 then, he remains among its youngest-ever recipients. He then went on to a distinguished career as a theoretical astrophysicist, science administrator, and science popularizer.

Dr J.V. Narlikar has been in academia all his life. He grew up in the environs of Banaras Hindu University, where his father was a mathematics professor and his mother a Sanskrit scholar. After graduating from BHU, he went to Cambridge University where he soon became a star pupil and collaborator of the British astronomer Fred Hoyle.

The two developed a new theory of gravity (the reason for Narlikar's Padma Bhushan), and were leading lights in a fierce intellectual dispute in the 1960s between proponents of the "Big Bang" and "Steady State" theories about the origin of the universe. Unlike those scientists who believed that the universe suddenly emerged more than 13 billion years ago, steady state theorists like Hoyle and Narlikar argued that the universe has always existed. Today, most cosmologists accept the big bang theory, but Narlikar continues to tenaciously defend steady state, although with certain modifications. He is also in a minority among scientists in believing—as did Fred Hoyle—that life on earth began when micro-organisms that evolved elsewhere in the universe arrived here.

After returning to India in 1972, he joined Mumbai's Tata Institute of Fundamental Research (TIFR) where he built a strong centre for theoretical astrophysics. In 1988 he started a centre to promote the growth of astronomy and astrophysics in Indian universities. Alongside his research and administrative commitments, he has written science fiction as well as popular science books in English, Hindi and Marathi. He has served on the prime minister's science advisory council and was awarded the Padma Vibhushan in 2004.

Reader's Digest recently met Jayant Narlikar in his small first-floor office at the Inter-University Centre for Astronomy and Astrophysics, Pune, where he is now professor emeritus.

Mahadevan: *How did you find maths as a child?*

JVN: Maths was easy because it was the subject I liked most. My 3rd standard teacher once asked every child what his father did. I said my father was a professor. "Professor of what?" my teacher asked. I didn't know. "Your father is professor of mathematics," the teacher said. I was very pleased my father was the professor of the subject I liked!

Mahadevan: *What was it about maths that you enjoyed?*

JVN: The logical reasoning. Not number crunching. I couldn't multiply two very large numbers instantly like Shakuntala Devi.

Mahadevan: *How can parents get their children interested in maths—or at least to not be afraid of it?*

JVN: They should introduce children to books on recreational maths. My wife, who is a mathematician, and I wrote a book two years ago called "Fun and Fundamentals of Mathematics." In it we put together problems school kids could solve. Maths should be treated as an intellectual challenge, rather than the routine working out of sums. That puts children off. When I was in the 10th standard, we had a test in which the Pythagoras theorem was asked. I gave a proof which was different from the one in the geometry text book, something I had worked out myself. It was much simpler and very short. My teacher gave me full marks but advised me not to give this proof in the final exam. "There," he said, "the examiner has to examine a lot of answer books. He will think you've done something strange and give you zero."

Mahadevan: At feast your *teacher was appreciative of what you'd done. What kind of teacher was Fred Hoyle?*

JVN: When I first went to see him as a PhD student he suggested four or five problems for me to work on, none of them on the steady state theory. I was disappointed because I really liked that field. When I asked him why, he said that it was a controversial theory and he didn't want a new research student to face controversy.

Then in January 1961, Martin Ryle, the Cambridge radio astronomer, came up with observations which he claimed disproved the steady state theory. He was to present this at the Royal Astronomical Society meeting in February. Fred said we could work out a counter example to Ryle's claim and show that his observations could be explained within the steady state theory. But we had two weeks only, and since there was no computer, I had to do the numerical work very fast. But we managed to find a solution. Then Hoyle discovered that he was committed to lecturing to some undergraduate group in London the very day of the meeting, so he said, "You present it." I was very scared. But Fred said, "If you are confident that your mathematical treatment is correct, there is no way they can shoot you down." He then trained me to present the work. His training was good and I managed well.

When I started training students, I made them independent so that they could present work on their own and have confidence in what they had done.

Mahadevan: *Stephen Hawking has said he decided to study cosmology because he was inspired by a summer course he took with you.*

JVN: I don't know about that. But in June or July 1961, I gave a couple of talks on cosmology to students at the Royal Greenwich Observatory. Stephen was in the audience

and asked a lot of questions. Later, we had a table tennis tournament and I beat him in the final. He was still fit then.

Mahadevan: You *write science fiction. Do you read much of it too?*

Not much, because I'm turned off if the fiction contradicts the science I know without explanations. For example, relativity says that nothing can move faster than light, but in one novel people were traversing the galaxy in the matter of a few years whereas light would take a hundred thousand years.

But I like the science fiction of Isaac Asimov, Arthur C. Clarke, and Fred Hoyle. And Jules Verne. In his "Around the World in Eighty Days" he has very cleverly made use of the fact that as you go east, you drop a few hours.

Mahadevan: *I believe you named your eldest daughter Geeta because of your fondness for the Bhagavad Gita. You are also, like your parents, well versed in Sanskrit. What are your religious views?*

JVN: I feel that religion can give you a code of conduct in which you find happiness in what you are doing, so that whatever you do is helpful or at least not damaging to your fellow human beings.

My father had books on all the important religions in the world. But he was an agnostic and didn't pray.

Mahadevan: *Would you describe yourself as an agnostic too?*

JVN: Yes, in the same sense. I go inside temples just to imbibe the atmosphere. I always find atmosphere very important in how I interact with a building. In fact, many times I feel more comfortable going into a church because I find quietness there. Hindu temples are too full of *hulla gulla* though there are some which are quiet.

Mahadevan: *Your wife is a mathematician and all three of your daughters are in the sciences. But a former president of Harvard University suggested that women are not as good as men in science and mathematics. Do you think that's true?*

JVN: I don't think so. In fact, insofar as mathematics is concerned you very often find more women liking it than men, but I don't think there is a significant difference.

Mahadevan: *You've suggested that many mathematical results—such as the theorem attributed to Pythagoras—should be renamed since they are described in Indian texts that predate the Greeks. But you also feel, don't you, that although ancient India produced a lot of good science, we tend to make all kinds of ridiculous claims too, such as having had guided missiles?*

JVN: Yes. This may be a reaction to having been subjected to foreign domination for many years. We take a passage from the Vedas—and it is very hard to really interpret the Vedas because the Sanskrit is different and everything is very concise—and expand it in whichever way we like. That makes it of doubtful value.

Mahadevan: *Why do many Indian scientists believe in astrology?*

JVN: I find that very disconcerting. It means that they are scientists only in terms of knowledge, not in terms of feeling. They are scientists at a superficial level, not deep down.

Mahadevan: *I believe your youngest daughter, Leelavati, named after the 12th century mathematician, got married recently. Did you consult horoscopes for your marriage or for those of your three daughters?*

JVN: No. My future father-in-law asked me what date I wanted. I said that my parents got married on 21st June—the longest day of the year. I find that a significant day in terms of the earth's orbit around the sun, so I said I'd like to get married on that day, whether or not it is auspicious.

My youngest daughter wanted to get married on 24th December because of its mathematical symmetry: In 24-12-06, half of 24 is 12 and half of 12 is 6. But her in-laws' astrologer said no day in December was auspicious.

Mahadevan: So what *happened?*

JVN: The astrologer changed his tune and said okay.

Mahadevan: Isn't *science so difficult to understand because it's so counterintuitive? For instance, I still can't understand how the universe can expand without expanding into itself.*

JVN: What the expansion of the universe really means is that the distance between any two galaxies increases over time. For example, when a metal grid is heated, its intersection points move away from each other.

Mahadevan: But *the grid expands into the room. I can't visualize what you're saying.*

JVN: Think in terms of the framework, not boundaries.

Mahadevan: Would you *encourage young Indians to become scientists?*

JVN: If you really like science then there are enough challenges. Not just in astronomy but in other branches. And in the applied sciences too. In nanotechnology, in biotechnology. ISRO has this ambitious program of going to the moon and needs young scientists.

Mahadevan: Why has *there been so little top quality research in the pure sciences in India since Independence? We seem to have done better before we became free.*

JVN: We have allowed our universities to degenerate. They are given very little research funding. Most of the money goes to special centers like the TIFR or the Raman Research Institute. If you want to excite young students to do research they should see research being done in the environment where they are studying. Only a few people are doing good research in universities. In institutes where there is reasonable amount of research being done, there are very few students. If the research institutions were on university campuses then things might have been different. We should try to link university students and teachers with research institutes more closely.

Mahadevan: *Some scientists get a spiritual high from science—they feel connected to the universe. What do you get?*

JVN: Intellectual challenge.

Mahadevan: Do you *think you could ever have been anything other than a scientist?*

JVN: A Sanskrit scholar, perhaps? It's hard to tell.